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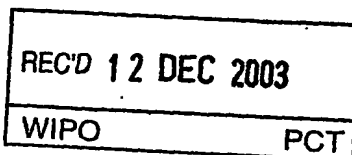
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**Certificate**  
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REPUBLIEK VAN SUID-AFRIKA

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the documents annexed hereto are true copies of:

Application form: P.1, provisional specification and  
drawings of South African Patent Application No. **2002/8671**  
as originally filed in the Republic of South Africa on **25 October**  
**2002** in the name of **SOUTH AFRICAN NUCLEAR ENERGY**  
**CORPORATION LIMITED** for an invention entitled: "**PRODUCTION**  
**OF COMPOSITES**".

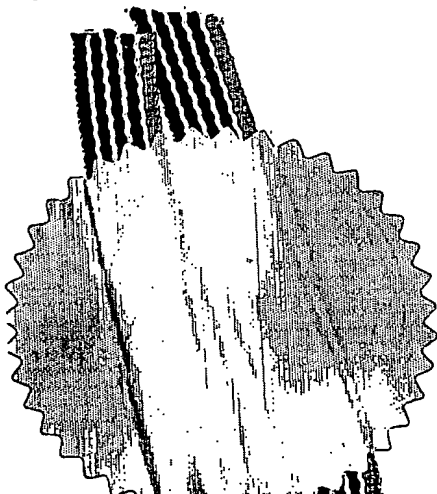
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In die Republiek van Suid-Afrika, hierdie  
In the Republic of South Africa, this

**13th**

dag van  
day of **November 2003**



Registrateur van Patente

REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978  
APPLICATION FOR A PATENT AND  
ACKNOWLEDGEMENT OF RECEIPT  
(Section 30(1) Regulation 22)

FORM P.1 REVENUE  
(to be lodged in duplicate)

25.10.02

R 060.00

THE GRANT OF A PATENT IS HEREBY REQUESTED BY THE UNDERMENTIONED APPLICANT  
ON THE BASIS OF THE PRESENT APPLICATION FILED IN DUPLICATE

REPUBLIC VAN SUID AFRIKA

21 01 PATENT APPLICATION NO. 2002/8671 A&A REH/ASR V15480-AS

71 FULL NAME(S) OF APPLICANT(S)

SOUTH AFRICAN NUCLEAR ENERGY CORPORATION LIMITED

ADDRESS(ES) OF APPLICANT(S)

Pelindaba, District BRITS,  
Gauteng Province, Republic of South Africa

54 TITLE OF INVENTION

"PRODUCTION OF COMPOSITES"

Only the items marked with an "X" in the blocks below are applicable.

☐ THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. The earliest priority claimed is

Country:

No:

Date:

☐ THE APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO. 21 01

☐ THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON  
APPLICATION NO. 21 01

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ A single copy of a provisional specification of 17 pages  
☒ Drawings of 1 sheet  
☐ Publication particulars and abstract (Form P.8 in duplicate) (for complete only)  
☐ A copy of Figure of the drawings (if any) for the abstract (for complete only)  
☐ An assignment of invention  
☐ Certified priority document(s). (State quantity)  
☐ Translation of the priority document(s)  
☐ An assignment of priority rights  
☐ A copy of Form P.2 and the specification of RSA Patent Application No. 21 01  
☒ Form P.2 in duplicate  
☐ A declaration and power of attorney on Form P.3 - TO FOLLOW LATER  
☐ Request for ante-dating on Form P.4  
☐ Request for classification on Form P.9  
☐ Request for delay of acceptance on Form P.4  
☐ Extra copy of informal drawings (for complete only)

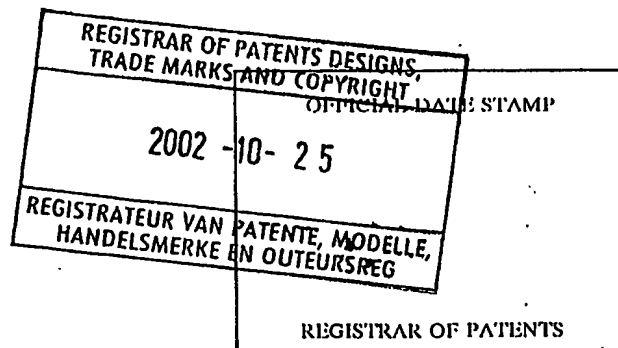
74 ADDRESS FOR SERVICE: Adams & Adams, Pretoria

Dated this 25th day of October 2002

AV VR SCHWEIZER  
ADAMS & ADAMS  
APPLICANT'S PATENT ATTORNEYS

The duplicate will be returned to the applicant's address for service as  
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A&A P201



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PATENT ATTORNEYS  
PRETORIA

FORM P6

REPUBLIC OF SOUTH AFRICA  
Patents Act, 1978

## PROVISIONAL SPECIFICATION

(Section 30 (1) - Regulation 27)

21	01	OFFICIAL APPLICATION NO
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22	LODGING DATE
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25 OCTOBER 2002

2002/9571

71	FULL NAME(S) OF APPLICANT(S)
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SOUTH AFRICAN NUCLEAR ENERGY CORPORATION LIMITED

72	FULL NAME(S) OF INVENTOR(S)
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CARSTENS, Pieter Andries Blatt  
LOUW, Izak de Villiers

54	TITLE OF INVENTION
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"PRODUCTION OF COMPOSITES"

**THIS INVENTION** relates to a process for the production of composite materials, structures and/or artifacts wherein a cementitious matrix is strengthened or reinforced by reinforcing material. The invention also relates to such composite materials, structures and/or artifacts, particularly when produced by means of said process.

According to the invention, in the production of a composite material, structure or artifact which comprises a cementitious matrix which is strengthened or reinforced by reinforcing material to which the matrix adheres, by bringing a reinforcing component into contact with a cementitious component which is in a castable or settable state, and causing or allowing the cementitious component to set in contact with the reinforcing component, thereby to form a cementitious matrix which bonds adhesively to the reinforcing component to form an adhesive bond therebetween, there is provided a process for enhancing adhesion of the set matrix to the reinforcing material, which process comprises the step, prior to

bringing the components into contact with each other, of subjecting the reinforcing component to surface activation thereof, the surface activation being effected by exposing the surface of the reinforcing component to an activating atmosphere which is a gas/vapour mixture which contains:

at least one fluorine-containing gas which acts to fluorinate the surface;

at least one oxygen-containing gas which reacts with the surface so that the activating atmosphere acts to activate the surface by oxyfluorination; and

water vapour which acts to promote a high bond strength, when exposed to shear-inducing forces, of the adhesive bond between the cementitious matrix and the reinforcing material.

The cementitious matrix may have a relatively low tensile strength and/or low fracture toughness, while the reinforcing material may have a relatively high tensile strength. As indicated above, the matrix will be of a set cementitious material, such as a cement, a concrete, a cementitious mortar or the like, formed from a cement-containing castable or settable cementitious component.

The reinforcing material will thus be solid at ambient temperatures and may comprise particles such as granules, or, in particular, fibres of a polymeric hydrocarbon i.e. a hydrocarbon polymer. In one embodiment, the hydrocarbon polymer is a polyhydrocarbon which consists only of hydrogen and carbon, being, for example, a polypropylene or a polyethylene, such as an ultra high mass polyethylene (UHMPE). The polypropylene may form part of a mixture or blend of two or more such hydrocarbons, which may be of a type selected from

hydrocarbon homopolymers and copolymers such as block copolymers, random- or statistical copolymers and graft copolymers, and from higher polymers such as terpolymers, containing only hydrogen and carbon. In other embodiments the hydrocarbon polymer may comprise a polymer of an olefin which does not contain only carbon and hydrogen, but which also contains constituents other than only carbon and hydrogen, also being of a type selected from homopolymers or copolymers such as block copolymers, random- or statistical copolymers, graft copolymers, or higher polymers such as terpolymers, for example being polyamides (nylons), aramids (kevlar) or acrylonitrile butadiene styrenes (ABS polymers), one or more of which olefins is a monomer with a constituent other than hydrogen or carbon. The polymer having a constituent other than hydrogen or carbon may exhibit a contact angle with regard to liquid water of  $>90^\circ$  before activation thereof to oxyfluorinate its surface in accordance with the method of the present invention. Blends or mixtures which are employed as reinforcing components may be formed by physically blending their constituents or by polymerizing their constituents together in a reactor. Whatever the nature of said reinforcing component, its contact angle with water may, however, be  $>90^\circ$  before activation so that, before the activation, it is poorly wettable by water. In still further embodiments the reinforcing material may be selected from materials other than polymeric hydrocarbons but which have surfaces which can be activated by the activating atmosphere, such as carbon.

The reinforcing component may be fibrous in nature, comprising particles which are fibres, normally in cut form, and which, on the one hand, have

a length, and, on the other hand, have a width, breadth or thickness being variable over a wide range, depending on their application, from somewhat larger than 1:1 up to 10,000:1 or more.

The fibre lengths may be 2-600mm, typically 6-50mm, and the fibre widths, breadth or thicknesses may be 1-10,000 $\mu$ m, typically 15-7,000 $\mu$ m. The proportion of fibres in the substrate or matrix can vary over a wide range, but it is expected that it will be at least 0.005% by volume. Typically, the fibres are manufactured as continuous monofilaments of regular cross-section, such as circular or rectangular, which monofilaments are then chopped into short discrete fibres, or are manufactured as fibrillated films or tapes. Fibres of polypropylenes, are believed to be particularly suitable in view of their alkali-resistance in the alkaline environment of the cementitious matrix, their relatively high melting point, and their relatively low cost.

The composite material, structure or artifact may then be formed by mixing the fibres with the cementitious component, when the cementitious component is in castable, mouldable, extrudable or flowable form, e.g. in powder, slurry, paste or liquid form to form a mixture, and shaping the mixture into a product such as a structure or artifact, e.g. by casting or moulding, after which the cementitious component is allowed or caused to set to form the matrix material, thereby adhesively securing itself to the fibres. Thus, the composite material, structure or artifact can be formed in known fashion such as by means of premixing, spray-up, shotcreting, a pulp-type process, hand lay-up, or continuous

production. The fibres of the reinforcing material are preferably uniformly but randomly distributed throughout the cementitious matrix of the composite material, structure or artifact.

In another embodiment of the invention, the reinforcing component may be in the form of a bar, rod, grill, sieve, mat, mesh, web, shaped reinforcing element, or fibre sheeting. When in the form of a bar or rod, the reinforcing component may be relatively short or long, in the fashion of steel reinforcement. The mat, when used, may be perforated, such as a polyethylene mat available in South Africa under the trade mark "LOKFLO" from Dita Products (Proprietary) Limited of 138 Axle Road, Devland, Johannesburg, South Africa. The mesh, when used, may be cast or woven. The shaped reinforcing element, when used, may be a bar or rod of X or Y cross-sectional shape. The fibre sheeting, when used, may be woven or felted. Indeed, the reinforcing component may be of any other suitable shape and dimension, provided that it has said oxyfluorinated surface. The reinforcing component will then be embedded in the cementitious matrix. This may be effected by locating it in the cementitious component while the latter is in castable, extrudable or flowable form, after which the cementitious component is caused or allowed to set to form the matrix material, thereby adhesively to secure itself to the reinforcing component.

In a yet further embodiment of the invention, the reinforcing component may be secured, as a surface layer such as cladding, to the cementitious component, thereby to reinforce the cementitious component and

thus form the composite structure or artifact. In this case the cementitious component may be cast in contact with the surface-activated surface reinforcing layer. In particular, the composite artifact may be a pipe wherein the reinforcing component is adhesively attached to the cementitious component, said components being tubular and the reinforcing component forming an internal and/or external lining for the cementitious component, adhesively secured thereto by a cementitious adhesive bond, the surface of the reinforcing component which is adhesively secured to the cementitious component being oxyfluorinated in the presence of water vapour in accordance with the invention.

Exposing the surface of the reinforcing component to the activating atmosphere will be under conditions of pressure and temperature, and for a reaction time, selected to provide the surface with desired properties. The fluorine-containing gas may be fluorine itself ( $F_2$ ), or it may be made up of one or more other suitable fluorine-containing gases, examples of which are fluorinated noble gases such as  $XeF_2$ , or fluorohalogens such as  $ClF$ ,  $ClF_3$ ,  $BrF$ ,  $BrF_3$ ,  $BrF_5$ , and  $IF_7$ , or oxides of fluorine such as  $OF_2$  or  $O_2F_2$  so that, in other words, the activating atmosphere may include at least one fluorine-containing gas selected from the group consisting of  $F_2$ ,  $XeF_2$ ,  $ClF$ ,  $ClF_3$ ,  $BrF$ ,  $BrF_3$ ,  $BrF_5$ ,  $IF_7$ ,  $OF_2$  or  $O_2F_2$  and mixtures of at least two such gases. The oxygen-containing gas may be selected from the group consisting of  $O_2$ ,  $O_3$  and mixtures thereof. Optionally, the activating atmosphere may include, in addition to any fluorine-containing gas, any oxygen-containing gas and any further reactive gas, also at least one inert - or diluent gas which is inert to, and does not react with, the reinforcing component

surface, such as helium, argon or, in particular, nitrogen ( $N_2$ ). Thus, in particular, the activating atmosphere may be a mixture of fluorine gas and moist air, having, as constituents,  $F_2$ ,  $O_2$ ,  $N_2$ , and water vapour.

The reaction conditions may vary between relatively broad limits. Thus, exposing the reinforcing component surface to the activating atmosphere may be for a period of 0.10 seconds - 10 hours, at a total pressure of the activating atmosphere of 0.1 kPa - 500 kPa and at a temperature of the surface of the reinforcing component and activating atmosphere of above  $0^\circ C$  at which the reinforcing component is solid. Furthermore, in the activating atmosphere, the fluorine-containing gas may have a partial pressure from as low as 0.01 kPa up to as high as 200 kPa, when the fluorine-containing gas is  $F_2$ . Preferably, thus, the activation is effected by exposing the reinforcing component to the activating atmosphere at a pressure of 1 - 200 kPa, more preferably 5 - 150 kPa, and at a temperature above  $0^\circ C$  and below the melting point of the material of the reinforcing component, i.e. typically  $20-100^\circ C$ . Reaction times which are short have been found to be feasible, for example 0.1-60 seconds, typically 0.1-10 seconds or even 0.1-1 seconds.

The activating atmosphere may, in addition to its comprising a fluorine-containing gas, an oxygen-containing gas, water vapour and any inert or diluent gas used, contain also at least one further reactive gas selected from halogens other than fluorine, such as chlorine ( $Cl_2$ ), bromine ( $Br_2$ ) or indeed iodine ( $I_2$ ) vapour, or selected from oxides of sulphur, oxides of nitrogen and oxides of

carbon, interhalogen compounds or mixtures thereof. The proportion of the fluorine-containing gas in such gas mixtures can vary within wide limits. Thus, the fluorine-containing gas may form 0,1-99,0 % by volume of said mixture, typically 1 - 30% by volume thereof. Particularly preferred gas mixtures include those comprising 5 - 20% by volume of fluorinating gas such as  $F_2$  and 5-95% by volume oxygen ( $O_2$ ). The water vapour content of the activating atmosphere may be such that it has a relative humidity of 0.1 -99%, preferably 50 - 80%.

In particular, the activating may be such as to provide the reinforcing component with a surface tension at 20°C of at least 40 mN/m. While the activating may be such as to provide the activated surface with a relatively low surface fluorine concentration, e.g. in the range of  $0.01 \mu gF/cm^2$  -  $50 \mu gF/cm^2$ , higher surface fluorine concentrations of above  $50 \mu gF/cm^2$  are obtainable, if desired. In a particular embodiment, the fluorine-containing gas may be  $F_2$ , being present in the fluorinating atmosphere at a partial pressure of 0.01 kPa - 200 kPa, the exposing of the surface of the reinforcing component to the activating atmosphere being such as to provide the surface with a surface fluorine concentration of  $0.01-50 \mu gF/cm^2$ .

The process may include, prior to the activation step, the step of degreasing the reinforcing component, for example, by washing the reinforcing component with water and a detergent followed by rinsing it with water and then treating it with isopropanol or another suitable organic solvent such as those used in the motor trade for dislodging grease or oil. The method may include, after the

activation and before mixing, optionally hydrolysing the activated surface by subjecting it to a hydrolysis step, e.g. by leaving it in moist air, or immersing it in water, in each case for a suitable period. In a particular embodiment the method may include, prior to activating of the surface, the step of degreasing the surface, and, after the activating of the reinforcing component and before its contact with the cementitious component, the step of hydrolysing the activated surface.

Exposing the reinforcing component to the activating atmosphere may be in a reaction chamber or a reaction vessel, which has been flushed by means of the activating atmosphere, and may be carried out on a continuous basis or on a batchwise basis. If carried out on a continuous basis, exposing the reinforcing component to the activating atmosphere may be effected in in-line fashion by continuously transporting the reinforcing component through a reaction chamber, which may be open-ended, containing the activating atmosphere. The activating atmosphere may, if desired, be subjected to ultra-violet (UV) radiation, during the exposure of the reinforcing component thereto.

Naturally, routine experimentation will be carried out with regard to the various parameters such as activating atmosphere compositions and pressures, reaction times, temperatures and pressures, reinforcing component compositions and the fluorine and oxygen surface concentrations and surface tensions achieved thereon, to achieve optimum, or at least acceptable, results, bearing practical and economic considerations in mind.

According to another aspect of the invention, there is provided a composite material, structure and/or artifact which comprises a set cementitious matrix strengthened or reinforced by reinforcing material to which the cementitious matrix adheres, the matrix comprising a settable cementitious component which has set in contact with a reinforcing component to form a cementitious matrix in contact with a reinforcing material comprising said reinforcing component and which adheres thereto, by means of an adhesive bond, the reinforcing component having an oxyfluorinated surface to which the cementitious matrix adheres, the composite material, structure and/or artifact having been produced by the process of the present invention.

The invention will now be described, by way of illustrative example, with reference to the following Examples and with reference to the accompanying diagrammatic drawings, in which Figure 1 shows a three-dimensional view of a test sample used for the fibre pull-out tests described hereunder with reference to Examples 1 and 2;

#### Example 1 - Invention

Monofilament polypropylene fibres were produced by direct extrusion to have a rectangular cross-section nominally of 0.5mm x 1.3mm, the fibres having a length of 40mm, a specific gravity of 0.91, a tensile strength of 120MPa and an elongation at break of 14%. The fibres were loaded under a moist ambient air atmosphere into a vacuum reaction vessel and the vessel was evacuated down to

an absolute pressure of 15 kPa. The vessel was then loaded with a 20%  $F_2$ /80% $N_2$  (by volume) gas mixture up to a pressure of 45 kPa at a temperature of 38°C, to form an activating atmosphere in accordance with the present invention. The fibres had their surfaces activated by allowing them to remain in contact with the activating atmosphere in the vessel for 2.5 hours at 38°C, after which the vessel was flushed with ambient air. During this contact the surfaces of the polypropylene fibres were activated by oxyfluorination, in the presence of water vapour, by oxygen from the air at 15 kPa present in the vessel after evacuation, and by fluorine from the  $F_2/N_2$  gas mixture added, the water vapour also being derived from the air at 15 kPa remaining in the vessel after the evacuation and providing the activating gas at 45 kPa with a relative humidity of approximately 18%.

#### Example 2 - Control

Example 1 was repeated except that the air at 15 kPa present in the vessel before loading of the  $F_2/N_2$  gas mixture was replaced by a dry mixture of 21%  $O_2$ /79% $N_2$  (by volume). This was effected by evacuation of the vessel down to a hard vacuum at effectively zero pressure for purposes of practical utility, followed in turn by loading of the  $O_2/N_2$  mixture into the vessel and loading of the  $F_2/N_2$  mixture into the vessel.

A highly flowable and readily castable and smoothable mortar mix was prepared by mixing together ordinary Portland cement with dried natural river sand and water in a cement:water:sand mass ratio of 1:0.52:2. The river sand had a maximum particle size in the range of about 2-4.7mm and an average particle size in the range of about 0.6-1.5mm. Mixing was effected mechanically until the mixture was homogeneous. Fibre pull-out tests were then conducted on dumb-bell-shaped specimens, one of which is indicated by reference numeral 10 in Figure 1, prepared by casting fresh mortar mix into dumb-bell-shaped polymethylmethacrylate moulds. Each specimen had a thickness  $T$  of 20mm and a maximum width  $W$  of 51mm, and had a waist 12 which divided it into two lobed parts 14. A plastics sheet 16 at the waist 12 separated the parts 14 from each other to prevent bonding therebetween. One of the monofilament fibres, after surface activation, was embedded at 20 in the specimen 12 to extend along its polar axis 18, with half (20mm) of its length embedded in each lobed part 14. The specimen was then allowed to set to form a set cementitious matrix in which the reinforcing component formed by the fibre 20 was embedded, adhesive cementitious bonding taking place between the fibre 20 and the matrix. The cast specimens were cured respectively for 7 and 28 days in water at a temperature of 21-25°C. The strength of the adhesive interfacial shear bond between the fibre 20 and the cementitious matrix was measured using a tensile testing machine equipped with a 500N transducer and a data-logging system, operating at a pull-out rate of 2mm/minute. The interfacial shear bond strength was calculated by dividing the maximum shear bond force attained by the bonding area of the fibre, i.e:

$$\text{Interfacial shear bond strength} = \frac{\text{maximum shear bond force}}{\text{length of fibre} \times (\text{width} + \text{thickness of fibre}) \times 2}$$

The units of the shear bond force and length are selected so that the interfacial shear bond strength is obtained in MPa. The fibre pull-out test results are presented in the following table, Table 1, for fibres produced by both Example 1 and Example 2, and in each case after 7 and 28 days' curing time respectively, five specimens being tested in each case.

**TABLE 1**

<u>Shear bond strength (MPa)</u> <u>(7 days' curing)</u>		<u>Shear bond strength (MPa)</u> <u>(28 days' curing)</u>	
Example 1	0.40		0.33
	0.49		0.45
	0.58		0.55
	0.50		0.46
	0.44		0.50
Average	0.48	Average	0.46
Example 2	0.42		0.33
	0.39		0.39
	0.48		0.38
	0.35		0.40
	0.37		0.44
Average	0.40	Average	0.39

From Table 1 it emerges that the average interfacial bond strengths of the fibres treated according to Example 1 (Invention) were 0.48MPa and 0.46MPa respectively after 7 and 28 days' curing. The corresponding values for Example 2 (Control) were respectively

0.40MPa and 0.39MPa, respectively showing an increase of 20% after 7 days' curing and of 18% after 28 days' curing, compared with the control.

### **EXAMPLE 3 - Invention**

Example 1 was repeated using polypropylene fibres which were formed from fibrillated polypropylene tape produced by extrusion followed by a fibrillation process. The fibres had a nominal rectangular cross-section of 0.097mm x 7.5mm, being 36mm in length, with a specific gravity of 0.91, a tensile strength of 128MPa and an elongation at break of 5.3%.

### **EXAMPLE 4 - Control**

Example 2 was repeated using the fibrillated fibres of Example 3.

A proprietary cementitious mixture, Concor HT Wetcrete, obtained from Concor Technicrete (Proprietary) Limited, of 13 Church Street, Crown Industrial Area, Johannesburg, South Africa was prepared to form a shotcrete mixture and was admixed with fibrillated fibres whose surfaces had been activated in accordance with Examples 3 and 4 respectively.


The constituents of the mixture, including the aggregate and fibres, were admixed in a mechanical mixer which was connected to a spray nozzle by means of a peristaltic conveyor system. The proportion of fibres admixed with the shotcrete amounted to 9kg fibres/m<sup>3</sup> shotcrete. As soon as the mixture became homogeneous (i.e. after it was mixed for a period of about 4 minutes) it was passed along the peristaltic conveyor system and sprayed through the spray nozzle into a mould to spray-cast a square panel or plate having sides of 600mm and a thickness of 100mm. After the spray-casting, the panel or plate was left in the mould under air for 3 days, after which the panel or plate was water-cured for 25 days before energy-absorption tests were conducted on the panel or plate.

The energy-absorption tests were carried out by supporting each panel or plate along its 600mm edges while centre-point-loading was applied thereto over a central square area having sides of 100mm, respectively parallel to the 600mm sides of the panel or plate. The load was applied to the face of each panel or plate opposite to the direction from which the mixture arrived in the mould from the spray nozzle, i.e. the load was applied to the face of the panel or plate which, during the spray-casting, had rested on and abutted on the 600mm x 600mm floor of the mould which faced upwardly, the spraying taking place downwardly, from the spray nozzle into the mould and on to the floor.

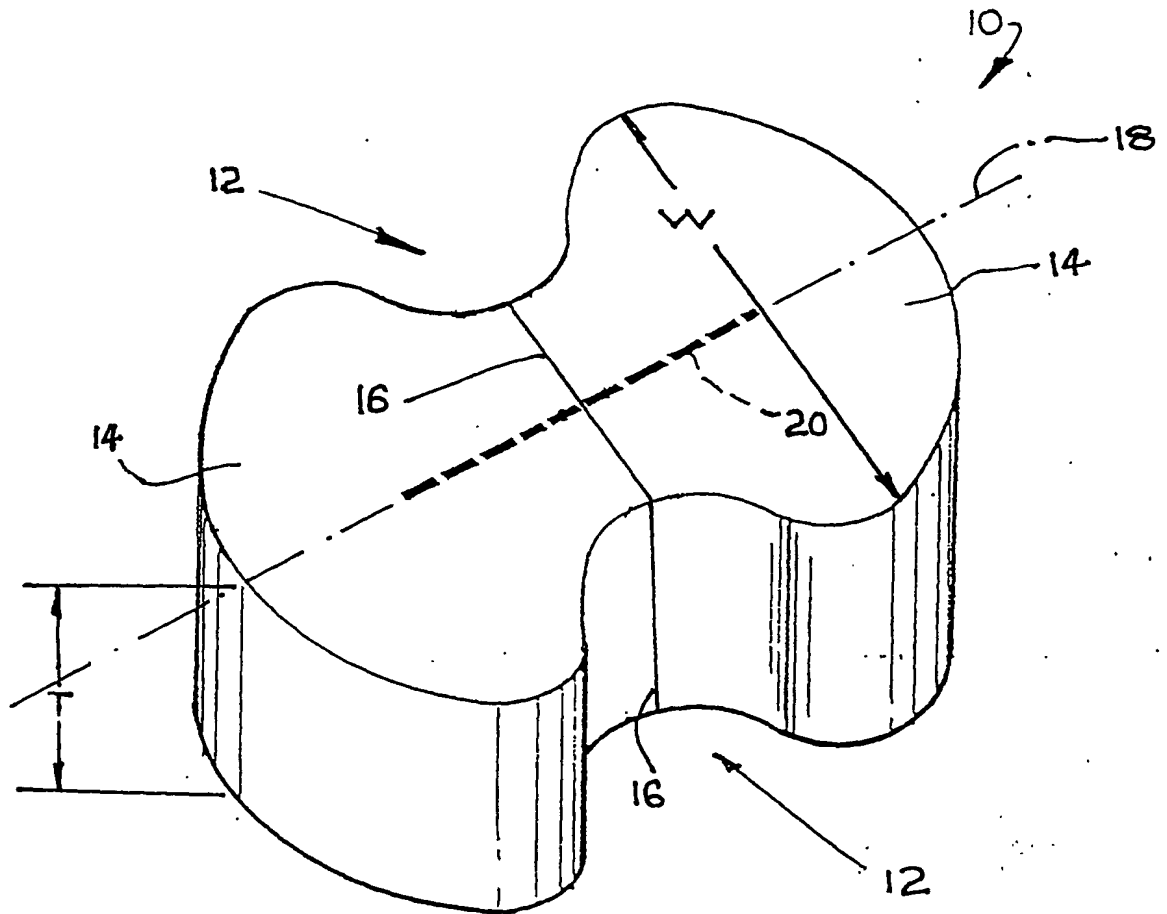
The panel or plate containing the fibres whose surfaces had been surface-activated in accordance with Example 3 was found to display a total energy absorption of 1096 joules(J), whereas the control panel or plate whose


fibres had been surface-activated in accordance with Example 4 was found to display a total energy absorption of 688 J, i.e. the use of the activation atmosphere of Example 3 led to an increase of 59% in energy absorption of the panel or plate, compared with Example 4. Furthermore, while the load-bearing capacity of the latter panel or plate was found to decrease from 67kN, progressively over a deformation range of 5-25 $\mu$ m to a value of 7kN, the load-bearing capacity of the former was found to decrease at a slower rate from 54kN, progressively over the same deformation range to a value of 26kN. Thus, the panel containing fibres activated in accordance with Example 3 (invention) had a 3.7 times higher residual load-bearing capacity than the control panel whose fibres had been activated in accordance with Example 4.

DATED THIS 25th day of OCTOBER 2002



AV vR SCHWEIZER  
ADAMS & ADAMS  
APPLICANT'S PATENT ATTORNEYS



  
AV vR SCHWEIZER  
ADAMS & ADAMS  
APPLICANT'S PATENT ATTORNEYS

LATE LODGING OF DOCUMENTS

REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978  
APPLICATION OR REQUEST TO THE REGISTRAR  
(Section 30(6) - Regulation 38)

REPUBLIC OF SOUTH AFRICA	
REVENUE	
19.2.03	R 050.00
FORM P.5	
REPUBLIC OF SOUTH AFRICA	
REVENUE	

21	01	PATENT APPLICATION NO	22	LODGING DATE	43	A&A REF
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2002/8671

25 OCTOBER 2002

V15460 AS/dcd

71	FULL NAME(S) OF APPLICANTS
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SOUTH AFRICAN NUCLEAR ENERGY CORPORATION LIMITED

74	ADDRESS FOR SERVICE
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ADAMS & ADAMS, PRETORIA

The following documents not accompanying the application as lodged or required by the Registrar are hereby submitted:

<input checked="" type="checkbox"/>	A declaration and power of attorney on Form P.3
<input checked="" type="checkbox"/>	An assignment of invention
<input type="checkbox"/>	One copy / two copies of the complete specification
<input type="checkbox"/>	Drawings of (sheets).
<input type="checkbox"/>	Certified priority document(s). (State quantity) .....
<input type="checkbox"/>	A copy of Figure of the drawings for the abstract
<input type="checkbox"/>	Publication particulars and abstract (Form P.8 in duplicate)
<input type="checkbox"/>	An assignment of priority rights
<input type="checkbox"/>	Translation of the priority document(s)
<input type="checkbox"/>	A copy of Form P.2 and the specification of RSA Patent Application No
<input type="checkbox"/>	Request for ante-dating on Form P.4
<input type="checkbox"/>	
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DATED THIS 19th DAY OF February 2003

ACKNOWLEDGEMENT OF LATE FILING  
OF DOCUMENTS



REGISTRAR OF PATENTS

A&A P205

AV R SCHWEIZER  
ADAMS & ADAMS  
APPLICANTS PATENT ATTORNEYS

OFFICIAL DEPOSIT
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